CLAIMS

1. A fuel cell having a hydrogen permeable metal layer that is formed on a plane of an electrolyte layer that has proton conductivity and includes a hydrogen permeable metal, said fuel cell comprising:

a temperature distribution equalizing portion to equalize an uneven temperature distribution in said fuel cell, wherein the uneven temperature distribution is caused by either or both of operating conditions of said fuel cell and surroundings of said fuel cell.

2. A fuel cell in accordance with claim 1, wherein the temperature distribution equalizing portion comprises a shift catalyst portion, which is formed to be in contact with an anode inside said fuel cell and contains a shift catalyst of accelerating a shift reaction to produce hydrogen and carbon dioxide from carbon monoxide and steam, and

the shift catalyst portion receives a supply of a reformed gas containing hydrogen, carbon monoxide, and steam and has a greater content of the shift catalyst in a specific region corresponding to a lower temperature area, which has a lower temperature than a remaining area due to either or both of the operating conditions of said fuel cell and the surroundings of said fuel cell, than a content of the shift catalyst in a residual region corresponding to the remaining area.

3. A fuel cell in accordance with either one of claims 1 and 2, wherein the operating conditions of said fuel cell include a temperature and a flow direction of a fluid supplied to said fuel cell.

4. A fuel cell in accordance with either one of claims 1 and 3, wherein the temperature distribution equalizing portion controls heat generation in a higher temperature area having a higher temperature than a residual area, due to either or both of the operating conditions of said fuel cell and the surroundings of said fuel cell.

5. A fuel cell in accordance with claim 4, wherein the temperature distribution equalizing portion suppresses an electrochemical reaction in the higher temperature area.

6. A fuel cell in accordance with claim 5, wherein the temperature distribution equalizing portion comprises a catalyst layer that contains a catalyst of accelerating the electrochemical reaction and is formed on an electrode of said fuel cell to have a less content of the catalyst in a specific region corresponding to the higher temperature area than a content of the catalyst in a residual region corresponding to the residual area.

7. A fuel cell in accordance with claim 5, wherein the temperature distribution equalizing portion comprises an electrode that is a thin metal membrane having the electrochemical reaction and is designed to have a smaller surface area in a specific region corresponding to the higher temperature area.

8. A fuel cell in accordance with claim 7, wherein the electrode is the hydrogen permeable metal layer.

9. A fuel cell in accordance with claim 5, wherein the temperature distribution equalizing portion comprises the hydrogen permeable metal layer that is designed to have a greater thickness in a specific region corresponding to the higher temperature area.

10. A fuel cell in accordance with any one of claims 1 and 3 through 9, wherein a reformed gas prepared by reforming a hydrocarbon fuel is used as a fuel gas supplied to an anode of said fuel cell.

11. A fuel cell in accordance with claim 4, wherein the temperature distribution equalizing portion comprises a reforming catalyst portion, which is formed to be in contact with an anode inside said fuel cell and contains a reforming catalyst of accelerating a reforming reaction to produce hydrogen from a hydrocarbon fuel, and

the reforming catalyst portion receives supplies of the hydrocarbon fuel and steam and has a greater content of the reforming catalyst in a specific region corresponding to the higher temperature area than a content of the reforming catalyst in a residual region corresponding to the residual area.

12. A fuel cell in accordance with any one of claims 1 through 11, wherein the temperature distribution equalizing portion is provided to deal with an uneven temperature distribution on an identical plane of said fuel cell as a unit cell of a fuel cell stack, which is caused by either or both of the operating conditions of said fuel cell and the surroundings of said fuel cell.

13. A fuel cell in accordance with any one of claims 1 through 11, wherein a number of said fuel cells as unit cells are laminated to form a fuel cell stack, and

the temperature distribution equalizing portion is provided to deal with a total uneven temperature distribution in the whole fuel cell stack, which is caused by either or both of the operating conditions of said fuel cells and the surroundings of said fuel cells.

14. A fuel cell device comprising a fuel cell having a hydrogen permeable metal layer that is formed on a plane of an electrolyte layer that has proton conductivity and includes a hydrogen permeable metal, said fuel cell device comprising:

a temperature distribution equalizing portion to control an uneven temperature distribution in said fuel cells, due to temperature and flow direction of a reactive gas supplied to said fuel cells to be subjected to an electrochemical reaction,

the temperature distribution equalizing portion comprising:

a first flow path and a second flow path to supply and discharge the reactive gas into and from said fuel cells;

a first switchover element that is provided in the first flow path to make a switchover between a gas intake state of allowing the reactive gas to be fed from a conduit connecting with the first flow path and to be introduced into said fuel cells and a gas discharge state of connecting the first flow path with outside to discharge the reactive gas flowed through said fuel cells to the outside; and

a second switchover element that is provided in the second flow path to make a switchover between the gas intake state of allowing the

reactive gas to be fed from a conduit connecting with the second flow path and to be introduced into said fuel cells and the gas discharge state of connecting the second flow path with the outside to discharge the reactive gas flowed through said fuel cells to the outside,

wherein the first switchover element and the second switchover element are controlled to regulate the flow direction of the reactive gas passing through said fuel cells.

15. A fuel cell device comprising a fuel cell having a hydrogen permeable metal layer that is formed on a plane of an electrolyte layer that has proton conductivity and includes a hydrogen permeable metal, said fuel cell device comprising:

a temperature distribution equalizing portion to control an uneven temperature distribution in said fuel cells, due to either or both of temperature and flow direction of a reactive gas supplied to said fuel cells to be subjected to an electrochemical reaction and surroundings of said fuel cells,

the temperature distribution equalizing portion comprising:

a reactive gas circulation module that recirculates at least part of a reactive gas exhaust, which is the reactive gas flowed through and discharged from said fuel cells, to the flow of the reactive gas; and

a reactive gas temperature decreasing module that decreases temperature of the reactive gas exhaust, prior to recirculation of the reactive gas exhaust to the flow of the reactive gas.